Remarks

Rejection Under 35 U.S.C. § 102

Claims 1, 2, 4, 11, and 15-18 were rejected under 35 U.S.C. § 102(a)/(e) as being anticipated by U.S. Publication No. 2002/0113095 to Jeon *et al.* ("Jeon"). Applicants respectfully traverse this rejection.

Jeon

Jeon discloses a diffusion-based method and device for forming gradients on a small scale, *e.g.* less than 10 cm, and is preferably much smaller (*e.g.* microns to mm in size) (para. 0036 and 0037). The method requires combining two or more fluid streams having laminar flow in a single microchannel. The streams are combined without turbulent mixing, through diffusion between the streams to produce a steady state gradient within the liquid stream (para. 0038). The location of the streams and the channel into which the streams combine is fixed. The streams do not move laterally with respect to each other. The gradient that is formed is determined by the diffusion kinetics of the mixing streams. The substrate onto which the gradient can adsorb forms part of the channel. For example, Jeon describes attaching via van der Waals forces or an adhesive a substrate to a microfluidic network that is fabricated in poly(dimethylsiloxane) (PDMS)(*see* para. 0066, para. 0067 and Figures 5 and 6). Figures 5 and 6 illustrate one example of this embodiment. As shown in the Figures, three inlet streams (220) combine into a single channel, which is in contact with a substrate (200). The combined streams in the channel form a

gradient, which can adsorb onto the substrate. The remaining material leaves the device through the outlet (230).

Claims 1, 2, 4, and 11 are novel

Claim 1 defines a different method for producing a gradient than the method disclosed by Jeon. Claims 2, 4 and 11 depend from claim 1. For example, claim 1 requires "exposing the substrate to the advancing front of the first solution", while Jeon's method does not use an advancing front. As noted above and as illustrated in Figures 5 and 6, Jeon's method requires that the channel and the substrate are stationary, relative to each other.

Further, claim 1 specifies that "the substrate is exposed to the advancing front of the first solution for a time period sufficient to adsorb the first adsorbate onto the surface of the substrate in an amount decreasing in concentration from a first area on the substrate to a second area on the substrate", while Jeon's method establishes the gradient based on the combination of the streams. Using Jeon's method, the gradient is formed ***prior to and independent of*** the adsorption of the fluid onto the surface; the time period during which the fluid in the channel is in contact with the fluid does not affect the type of gradient that is formed.

For at least the reasons discussed above, claim 1 and dependent claims 2, 4 and 11 are novel in view of Jeon.

Claims 15-18 are novel

Independent claim 15 defines a method of using a surface-chemical gradient for analysis comprising exposing the surface-chemical gradient to a molecule. Claim 15 specifies that the

surface gradient is radially symmetrical, with a first adsorbate in an amount decreasing in concentration from a first area on the substrate to a second area on the substrate and a second adsorbate in an amount increasing in concentration from the first area on the substrate to the second area on the substrate.

Independent claim 16 defines a surface-chemical gradient, where the surface gradient is radially symmetrical, with a first adsorbate in an amount decreasing in concentration from a first area on the substrate to a second area on the substrate and a second adsorbate in an amount increasing in concentration from the first area on the substrate to the second area on the substrate. Claims 17 and 18 depend from claim 16.

Contrary to the Examiner's assertion at page 4 of the Office Action, Jeon's disclosure that "one component may be deposited in a linear gradient increasing from left to right while a second component may be applied to the surface parabolically" (para. 0098) is quite different from independent claims 15 and 16, which require a radially symmetric gradient formed with a first adsorbate in an amount decreasing in concentration from a first area on the substrate to a second area on the substrate and a second adsorbate in an amount increasing in concentration from the first area on the substrate to the second area on the substrate. First, Jeon's gradient is not symmetric about any point, rather one gradient is linear and another gradient is parabolic. Second, even the parabolic gradient is not radially symmetric. A radially symmetric gradient is in the shape of a circle, with a gradient along the radius of the circle. A typical method for forming a radially symmetric gradient is described in the specification at least at page 5, lines 2-

8. As noted in the specification, a spreading growing droplet of the first adsorbate can be deposited on the substrate, and then a second immersion step may be used in which the substrate is immersed into a second adsorbate solution.

Jeon does not disclose forming a radially symmetric gradient. Further, it appears that Jeon's method is incapable for forming such a gradient. For at least these reasons, claims 15-18 are novel in view of Jeon.

Rejection Under 35 U.S.C. § 103

Claims 3, 7, 8, and 12 were rejected under 35 U.S.C. § 103(a) as being obvious over Jeon, in view of U.S. Patent No. 6,770,323 to Genzer *et al.* ("Genzer"). Applicants respectfully traverse this rejection.

Jeon

Jeon is discussed above. As noted above, there are a number of differences between the method described by Jeon and the method defined by independent claim 1 and its dependent claims. Further, Jeon focuses on forming very small, controlled gradients. The size of the gradient is typically smaller than 10 cm (para. 0036), preferably less than 1 mm long, with a diameter of preferably about 100 microns, which may be as small as 10 microns (para. 0062). Jeon prefers even smaller channels for making the gradients since small channels "provide for laminar flow at high velocities" (*id.*).

The Combination of Jeon with Genzer

Genzer was previously discussed at length in the Amendment and Response filed February 4, 2008. Therefore, Applicants are only highlighting a portion of the differences between Genzer and the claims in this response.

Genzer focuses on vapor deposition methods. Further, Genzer generally teaches away from using liquids to form chemical gradients, noting that prior techniques "are typically rather cumbersome and involve various 'wet chemistry' surface treatments, which is [*sic*] often times hard to control and not applicable to all materials." (Genzer, col. 1, lines 59-62) Genzer explains that its goal is to "develop methods that would both eliminate the 'wet chemistry' environment and produce surfaces with reproducible and tunable surface properties." (Genzer, col. 1, lines 62-65) Therefore one of ordinary skill in the art who was practicing the methods of Jeon would not look to Genzer to modify Jeon's methods.

With respect to using liquids in the method for forming a surface gradient, in one embodiment, Genzer uses a liquid bath that contains a liquid concentration gradient. The only disclosure possibly relating to an advancing front is the mention of "dipping in a liquid bath" at col. 14, line 37. However, Genzer does not disclose the rate at which the substrate is dipped into the bath. Since Genzer is merely exposing the substrate to a liquid source having a fluid concentration gradient for the purpose of creating a substrate with the same concentration gradient, the entire substrate would likely be in contact with the liquid source for essentially the

same time period to allow the component to deposit on the surface of the substrate in a concentration gradient that corresponds with the fluid concentration gradient in the liquid bath.

Jeon's method requires the use of a stationary substrate, relative to a stationary channel. Genzer's method requires a dipping step in one embodiment, but appears to require immersion of the entire substrate for the same period of time, rather than using the dipping process itself as the step that creates the gradient. Thus, neither Jeon nor Genzer disclose or make obvious the step of "exposing the substrate to the advancing front of the first solution, wherein the substrate is exposed to the advancing front of the first solution for a time period sufficient to adsorb the first adsorbate onto the surface of the substrate in an amount decreasing in concentration from a first area on the substrate to a second area on the substrate", as required by independent claim 1 and its dependent claims.

Therefore, dependent claims 3, 7, 8, and 12 are nonobvious over Jeon in combination with Genzer.

Allowance of claims 1-18 is respectfully solicited.

Applicants believe that the claims should be in condition for allowance. However, if the Examiner believes that any issues remain to prevent the allowance of the claims, Applicants respectfully request an interview with the Examiner.

Respectfully submitted,

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